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EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 08/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/024,208

Applicant(s)

COOPERBERG ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12,13
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-4, 6, 8, 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber 10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein

the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas at flow rates that are independently varied and wherein the gas outlets are supplied process gas by a single gas supply. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, therefore allowing improved controllability and

uniformity of the substrate processing being conducted within the chamber. As stated above, Fujii et al. discloses the use of a single gas supply line. Furthermore, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

With respect to claim 4, it should be noted that, as broadly claimed, Fujii et al. discloses the on-axis and the off-axis outlets, with respect to an axis perpendicular to the substrate surface.

Claims 5, 7, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Ishihara et al., U.S. Patent 5,160,543.

Ni et al. and Fujii et al. are applied as above but do not expressly disclose the claimed gas outlets limitations. Ishihara et al. discloses an apparatus comprising a gas injector having a center gas outlet 209 extending in an axial direction perpendicular to the exposed surface of the substrate and a plurality of angled gas outlets 210 extending at an acute angle to the axial direction (see fig. 2 and its description). Also note that the gas injector has a conical side surface having the off-axis outlets therein. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. modified by Fujii et al. as to comprise the

gas injector configuration taught by Ishihara et al. in order to efficiently introduce the gas(es) into the chamber and towards the substrate surface.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al. and Fujii et al. are applied as above but do not expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col. 9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the injector of the apparatus of Ni et al. modified by Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Claims 1-4, 6, 8, 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Yamazaki et al., U.S. Patent 4,105,810 and further in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber 10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas independently and wherein the gas outlets are supplied process gas by a single gas supply. Yamazaki et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets that are independently connected to a single gas supply line (see Figs. 1 and 3a and their description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was

made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Yamazaki et al. since it is a suitable structure for introducing gases into the chamber. As stated above, Yamazaki et al. discloses the use of a single gas supply line and as broadly claimed the on-axis and the off-axis outlets. Also, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

Ni et al. and Yamazaki et al. do not expressly disclose that the plurality of gas outlets are independently connected to the single gas supply through gas flow control valves to independently control the gas flow rates. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. modified by Yamazaki et al. to further comprise the gas flow controllers of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, thereby allowing improved controllability and uniformity of the substrate processing being conducted within the chamber.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Yamazaki et al., U.S. Patent 4,105,810 and Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al., Yamazaki et al. and Fujii et al. are applied as above but do not expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col. 9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the injector of the apparatus of Ni et al. modified by Yamazaki et al. and Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Ishihara et al., U.S. Patent 5,160,543 and further in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber

10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas independently and wherein the gas outlets are supplied process gas by a single gas supply. Ishihara et al. discloses an apparatus comprising a gas injector having a center gas outlet 209 extending in an axial direction perpendicular to the exposed surface of the substrate and a plurality of angled gas outlets 210 extending at an acute angle to the axial direction (see Fig. 2 and its description). Also note that the gas injector has a conical side surface having the off-axis outlets therein. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Ishihara et al. in order to efficiently introduce the gas(es) into the chamber and towards the substrate surface.

Ni et al. and Ishihara et al. do not expressly disclose that the plurality of gas outlets are independently connected to a single gas supply through gas flow control valves to independently control the gas flow rates. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. modified by Ishihara et al. to further comprise the gas flow controllers of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, thereby allowing improved controllability and uniformity of the substrate processing being conducted within the chamber. Also, as stated above, Fujii et al. discloses the use of a single gas supply line. Furthermore, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Ishihara et al., U.S. Patent 5,160,543, and further in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al., Ishihara et al. and Fujii et al. are applied as above but fail to expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col. 9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the injector of the apparatus of Ni et al. modified by Ishihara et al. and Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Response to Arguments

Applicant's arguments filed 6/25/03 have been fully considered but they are not persuasive.

Applicant argues that the combination of Ni et al., WO 00/41212 and Fujii et al., U.S. Patent 4,980,204 is improper because Fujii et al. does not show a gas injector with

multiple outlets but rather shows individual outlets consisting of individual pipes. However, applicant has not provided any definition in the specification of the instant application regarding what constitutes an injector, and the examiner respectfully contends that giving the claims their broadest reasonable interpretation, the three pipes of Fujii et al. can be considered parts of a single injector. Moreover, with respect to applicant's statement that a single injector is not shown, it is noted that the features upon which applicant relies (i.e., the single injector) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Additionally, in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation for combining the Ni et al. and Fujii et al. references is that this will provide independent flow control for each of the outlets of the injector, therefore allowing improved controllability and uniformity of the substrate processing being conducted within the chamber. For these reasons, the rejection over Ni et al. in view of Fujii et al. is maintained.

Regarding the rejection of claims 5, 7, and 9 under 35 USC 103(a) using the Ni et al., Fujii et al., and Ishihara et al. references, this rejection is maintained partially for the reasons stated above. Additionally, regarding applicant's contention that Ni et al. and Fujii et al. fail to disclose a conical surface having off-axis outlets therein and off-axis outlets receiving process gas from an annular passage surrounding the central passage, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, with respect to applicant's argument that Ishihara et al., U.S. Patent 5,160,543 does not disclose a gas injector having a conical side surface having off-axis outlets therein, the examiner respectfully submits that the injector structure of fig. 2, when given its broadest reasonable interpretation, shows the gas injector having a conical side surface having off-axis outlets therein, since the injector can be considered to be the outer portion of the injector (210) which encloses the on-axis outlet 209 and the off-axis outlets. Moreover, the gas flow to the on-axis outlet and off-axis outlets can be individually controlled.

With respect to the rejection of claim 15 using the Powell et al. reference, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's

disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation is because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Applicant also argues that the rejection of claims 1-4, 6, 8, and 10-14 under 35 USC 103 over Ni et al. in view of Fujii et al. and Yamazaki et al. is improper because the gas injector of Yamazaki et al. fails to show a plurality of gas outlets independently connected to a single gas supply line. However, the examiner respectfully disagrees and submits that the injector shown in fig. 1 has multiple outlets which are all connected to at least a single gas supply line. Furthermore, for the reasons submitted above, the rejection of claim 15 which adds the Powell et al. reference is also proper and is maintained.

Concerning applicant's contention that the rejection of claims 1-14 under 35 USC 103 over Ni et al. in view of Ishihara and further in view of Fujii et al. is improper

because Ishihara fails to disclose that the outlets are independently varied, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, the rejection of claim 15 which adds the Powell et al. reference is also maintained for the reasons discussed above.

Conclusion

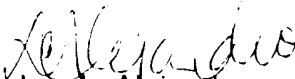
THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


Luz L. Alejandro
Primary Examiner
Art Unit 1763

August 14, 2003